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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/074,854	02/11/2002	Avi Topman	5018/ISM/CORE/MCVD	6836

32588 7590 09/22/2003

APPLIED MATERIALS, INC.
2881 SCOTT BLVD. M/S 2061
SANTA CLARA, CA 95050

EXAMINER

COLEMAN, WILLIAM D

ART UNIT	PAPER NUMBER
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2823

DATE MAILED: 09/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/074,854	Applicant(s) TEPMAN ET AL.	
	Examiner W. David Coleman	Art Unit 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-51 is/are pending in the application.
- 4a) Of the above claim(s) 28-51 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 22-27 is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>2</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election of group I invention, claims 1-27 in Paper No. July 15, 2003 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kinnard et al., U.S. Patent Application Publication No. U.S. 2003/015560 A1 in view of Honma et al., U.S. Patent 6,596,086 B1.

4. Kinnard discloses a semiconductor process substantially as claimed.

5. Pertaining to claim 1, Kinnard teaches a method of processing a substrate in a vacuum chamber, comprising:

admitting a substrate (see FIG. 2, where the substrate is not numbered) into the chamber **40** for processing with a process gas; admitting a process gas into the chamber to process the substrate in the chamber; restricting the flow of an exhaust gas [0049] flow through an exhaust outlet positioned on at least two sides of the substrate of the chamber to a first, non-zero flow rate which is less than 100 sccm [0054, please note that Kinnard discloses a flow rate in standard

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liters per minute in the range of 2.5 to 3.5 slm, in which 3 slm is equivalent to 50 sccm and within the range as claimed) to facilitate retaining process gas in the chamber to react with the substrate. However, Kinnard fails to teach after sufficient substrate processing with the process gas, increasing the exhaust flow rate to a second, higher flow rate to facilitate exhausting residue gas from the chamber. Honma teaches, increasing the exhaust flow rate to a second, higher flow rate to facilitate exhausting residue gas from the chamber. In view of Honma, it would have been obvious to one of ordinary skill in the art to incorporate the process step of Honma into the Kinnard semiconductor process because the reason of higher pressure for the purge gas is to prevent the raw material gas from entering the lower space through clearances between the process vessel and the susceptor (column 1, lines 56-61).

6. Pertaining to claim 2, Kinnard in view of Honma teaches the method of claim 1 further comprising pumping residue gas from the interior of the chamber and through the chamber exhaust outlet when the exhaust flow is at the second flow rate level. In view of Honma, it would have been obvious to one of ordinary skill in the art to incorporate the process step of Honma into the Kinnard semiconductor process because the reason of higher pressure for the purge gas is to prevent the raw material gas from entering the lower space through clearances between the process vessel and the susceptor (column 1, lines 56-61).

7. Pertaining to claim 3, Kinnard teaches the method of claim 1 wherein said exhaust gas flow restricting is initiated prior to said process gas admitting [0049].

8. Pertaining to claim 4, Kinnard teaches the method of claim 3 wherein said exhaust gas flow restricting is continued during said process gas admitting [0049].

9. Pertaining to claim 5, Kinnard fails to disclose the method of claim 4 said process gas admitting is terminated during said exhaust gas flow restricting. However, Honma teaches Applicants claimed limitation of terminating the process gas during said exhaust gas flow restricting. In view of Honma, it would have been obvious to one of ordinary skill in the art to incorporate the process step of Honma into the Kinnard semiconductor process because the reason of higher pressure for the purge gas is to prevent the raw material gas from entering the lower space through clearances between the process vessel and the susceptor (column 1, lines 56-61).

10. Pertaining to claims 6 and 7, Kinnard fails to teach the method of claim 1 wherein said first flow rate is less than 10 sccm and wherein said second flow rate is in a range of 10-20 slm.

Given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved. See *In re Aller, Lacey and Hall* (10 USPQ 233-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 f.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Any differences in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that

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the difference is really unexpected. *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986)

Appellants have the burden of explaining the data in any declaration they proffer as evidence of non-obviousness. *Ex parte Ishizaka*, 24 USPQ2d 1621, 1624 (Bd. Pat. App. & Inter. 1992).

An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

11. Pertaining to claim 8, Kinnard in view of Honma teaches the method of claim 4 further comprising admitting a purge gas into the chamber when the exhaust flow is at the second flow rate level to purge residue gas from the chamber.

12. Pertaining to claim 9, Kinnard in view of Honma teaches the method of claim 1 further comprising admitting a purge gas into the chamber when the exhaust flow is at the second flow rate level to purge residue gas from the chamber. In view of Honma, it would have been obvious to one of ordinary skill in the art to incorporate the process step of Honma into the Kinnard semiconductor process because the reason of higher pressure for the purge gas is to prevent the raw material gas from entering the lower space through clearances between the process vessel and the susceptor (column 1, lines 56-61).

13. Pertaining to claim 10, Kinnard teaches the method of claim 1 wherein said process gas admitting is continued during said exhaust gas flow restricting, causing the pressure in said

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chamber to rise to a first pressure level (please note that it is not clear as to what Applicants are trying to claim since the laws of physics would dictate the limitations of claim 10).

14. Pertaining to claims 11 and 13, Kinnard in view of Honma fails to disclose the method of claim 10 wherein said first pressure level is in a range of 5-300 Torr. Given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved. See *In re Aller, Lacey and Hall* (10 USPQ 233-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 f.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

15. Pertaining to claim 12, Kinnard in view of Honma teaches the method of claim 10 wherein said increasing the exhaust flow rate to a second flow rate causes the pressure in said chamber to fall to a second, lower pressure level (please note that it is not clear as to what Applicants are trying to patent since the limitations of claim 12 are dictated by the laws of physics and if the independent claim from which this claim depends on becomes patentable, these types of claims that depend on some natural order are not patentable. It is suggested that Applicants amend the claims to over-come the present rejection or cancel the claims).

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16. Pertaining to claim 14, Kinnard discloses the method of claim 1 further comprising heating the substrate using a fixed heater disposed in a fixed substrate support [0039].

17. Pertaining to claim 15, Kinnard discloses the method of claim 1 wherein said process gas admitting admits one or more deposition process gasses which form onto the substrate one or more layers of one or more deposition materials selected from the group of tantalum, tantalum nitride, tantalum oxide, titanium, titanium nitride, tungsten, tungsten silicide, silicon nitride, and aluminum oxide [0034].

18. Pertaining to claim 16, Kinnard in view of Honma teaches method of processing a substrate in a vacuum chamber, comprising:
reducing the conductance level of a non-sealing flow restrictor surrounding the substrate to a first, non-zero conductance level, wherein the flow restrictor couples the interior of the chamber to an exhaust port of the chamber;
admitting a substrate into the chamber for processing with a deposition gas;
admitting the deposition gas into the chamber to react with a substrate in the chamber while the flow restrictor is at the first conductance level wherein the flow restrictor at the first conductance level limits the exhaustion of deposition gas through the exhaust flow restrictor to the exhaust port to a first, non-zero flow rate to facilitate retaining deposition gas in the chamber to react with the substrate; and
after sufficient substrate processing with the deposition gas, increasing the conductance of the non-sealing flow restrictor to a second, higher conductance level to increase the flow rate of

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residue gases being exhausted through the flow restrictor to the exhaust port to a second, higher flow rate. In view of Honma, it would have been obvious to one of ordinary skill in the art to incorporate the process step of Honma into the Kinnard semiconductor process because the reason of higher pressure for the purge gas is to prevent the raw material gas from entering the lower space through clearances between the process vessel and the susceptor (column 1, lines 56-61).

19. Pertaining to claim 17, Kinnard discloses the method of claim 16 further comprising pumping residue gas from the interior of the chamber, through the flow restrictor to the chamber exhaust port when the flow restrictor is at the second conductance level.

20. Pertaining to claim 18, Kinnard discloses the method of claim 1 wherein said flow restrictor conductance level reducing is initiated prior to said deposition gas admitting.

21. Pertaining to claim 19, Kinnard in view of Honma teaches the method of claim 18 wherein the flow restrictor limits the exhaustion of deposition gas to the first flow rate during said deposition gas admitting.

22. Pertaining to claim 20, Kinnard in view of Honma teaches the method of claim 19 wherein said deposition gas admitting is terminated during said exhaust gas flow restricting.

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23. Pertaining to claim 21, Kinnard in view of Honma teaches the method of claim 16 further comprising admitting a purge gas into the chamber when the exhaust flow is at the second flow rate level to purge residue gas from the chamber. In view of Honma, it would have been obvious to one of ordinary skill in the art to incorporate the process step of Honma into the Kinnard semiconductor process because the reason of higher pressure for the purge gas is to prevent the raw material gas from entering the lower space through clearances between the process vessel and the susceptor (column 1, lines 56-61).

Allowable Subject Matter

24. Claims 22-27 allowed.

25. The following is an examiner's statement of reasons for allowance: prior art does not anticipate nor render obviousness as to the method of depositing materials on a substrate in a vacuum chamber wherein a first, second, third and fourth cycle are used incorporating a closing non-sealing circular flow restrictor surrounding the substrate.

26. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

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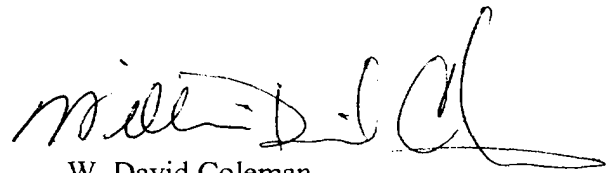
Conclusion

27. Any inquiry concerning this communication or earlier communications from the examiner should be directed to W. David Coleman whose telephone number is 703-305-0004.

The examiner can normally be reached on 9:00 AM-5:00 PM.

28. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

29. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

A handwritten signature in black ink, appearing to read 'W. David Coleman', with a long horizontal flourish extending to the right.

W. David Coleman
Primary Examiner
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WDC